



Attorney's Docket No. 5051-460IP

PATENT

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Application of DeSimone et al.

Serial No.: 09/516,482

Filed: 1 March 2000

For: *METHODS OF MAKING FOAMED
MATERIALS USING SURFACTANTS
AND CARBON DIOXIDE*

Group Art Unit: 1711

Examiner: M. Bissett

Date: March 20, 2003

Commissioner for Patents
Washington, DC 20231

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**DECLARATION OF JOSEPH R. ROYER
PURSUANT TO 37 C.F.R. § 1.132**

I, Joseph R. Royer, do hereby declare and state as follows:

1. I am currently employed as a Research Engineer with Milliken Research Corporation (Spartanburg, South Carolina), a position I have held since February of 2002. I received my B.S in Chemical Engineering from the University of Notre Dame in 1995 and my Ph.D. in Chemical Engineering from North Carolina State University in 2000. I also performed post-doctoral work under George Roberts at North Carolina State University from 2000 to 2002, primarily researching supercritical fluid assisted polymer processing.
2. I am a named inventor of the above-referenced invention and am familiar with the subject matter described and claimed therein.
3. I have reviewed U.S. Patent No. 5,922,493 to Humphrey, Jr. et al. (Humphrey), which is cited against the above-referenced patent application.
4. Humphrey discloses or discusses via reference several different methods for producing foam of adequate size and type for electrochemical articles, which are the intended result of the Humphrey process. Humphrey discloses three distinct methods for generation of the

desired foam structure for the PVDF electrode (*see* column 8, line 18 to column 9, line 48). The first method is the so-called solvent and non-solvent combination method, which is further described in U.S. Patent No. 4,284,047 to Benzinger et al. This method involves dissolving a small percentage of a polymeric material into a solvent (15-20% by weight). A non-solvent is then used to form a porous structure after treatment with a gelation medium and partial evaporation of the original solvent. As detailed in Benzinger, the cells of the foam that is generated via this process “are asymmetric, and ultrafiltration takes place at a very thick 'skin' or layer of critical porosity at the top surface, the rest of the membrane being more porous and offering little resistance to flow” (*see* Benzinger at column 9, lines 25-29). Because the majority of these structures “offer little resistance to flow”, they must by definition be open-cell foams. These are foams in which adjacent cells are connected so that fluid may pass between one cell and the next allowing a filtration process to occur. These cells are not distinct, separate voids, which are surrounded by solid polymer cell walls and isolated from one cell to the next – the definition of closed-cell foam. It can clearly be concluded that using this method generates an open-celled foam, and by the chemical nature of the solvent-non-solvent process closed-cell foam cannot be achieved.

5. The additional methods discussed in Humphrey specifically discuss by reference additional methods “for the manufacture of open cell foam porous polyvinylidene fluoride polymers.” Specifically Humphrey discusses the use of chemical and physical blowing agents and a process for producing foam from sintered PVDF powder. As Humphrey clearly states these are methods for to generate open-cell foams. Humphrey does not disclose a process to produce closed-cell foam.

6. In view of the foregoing, I believe that the methods discussed in Humphrey cannot be used to generate closed-cell foam, and I am not aware of any manner known in the current art to produce a closed-cell foam of a PVDF material as recited in the claims of the present application other than what is described in the present application.

7. I do hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 19 of the United States Code and that such willful false statements may jeopardize the validity of the above-referenced application or any patent issued thereon.

Joseph R. Royer
Joseph R. Royer

March 20th 2003
Date